Electric oscillating tangential tool

EOT-2

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1. General remarks

The EOT-2 is a processing unit for CNC-machines that is generally designed to cut various materials such as cardboard, sealing material, foils, corrugated cardboard, carbon fiber prepreg material, leather, rigid foam and many others. Nevertheless it´s finally up to the user to test the cuttability of respective materials. It´s not possible to assure the cuttability of certain materials because of the wide variety of applications and combinations of materials, blades, oscillating frequencies and feed rates.

The EOT-2 is a processing unit that is designed for the operation on a CNC machine with a closed and safety controlled working space. The manual usage of the unit is not allowed.

Important security advise !

The EOT-2 is intended to be used as a single component within a complete machining system. It is delivered as an incomplete unit that is not able to operate without a specified stepper or servo motor driver. It is strictly forbidden to operate the unit without implementing all necessary safety regulations.

The combination of the cutting unit and the machining system has to be done by an expert only. It is not allowed to put the unit in operation before all necessary and required country-specific safety regulations have been observed and checked carefully.

Only the operator of the facility (i.e. machining system) is responsible for observing all relevant safety regulations.

2. Operation and maintenance

2.1 Fixation of the material to be cut

The EOT-2 can be used for cutting various materials. It is necessary to fix the material on the cutting board.

In most cases it is essential to use a vacuum table in combination with a special air-permeable cutting mat (Art.-No. 230200).

2.2 Mounting the processing unit

The processing unit can be installed to the machining system similar to a conventional milling motor because of its 43mm clamp collar. It is strictly required to observe the machine builders mounting instructions to prevent the unit from loosening or turning out of position.

2.3 Mounting the blades

First the blade has to be mounted to the collet as illustrated. Then it has to be tightened on the weldon surface with a screw.

Because of the danger of cuts it is necessary to proceed with utmost care and to wear appropriate security clothing (e.g. cut-proof gloves). The processing unit is designed for using specialized blades. Any other or additional employment is not according to the intended use.

Important security advise !

The blades may only be replaced if it is ensured that no actuator or drive motor of the processing system or the machining system can move. Therefore it is necessary to shut off the machining system or to remove the processing unit mechanically and electrically. It is strongly advised to observe the safety regulations of the respective machine manufacturer.

There is a high risk of injury to hands and fingers because of very sharp blades.

2.4 Reference run and alignment of the blade

Before using the tool it is required to perform a reference run of the machining system to ensure that the blade is adjusted to the cutting direction. In most cases it is necessary to parameterize a blade offset.

This is a function of the respective machine control. For example, proceed as follows:

1. Do a reference run to the internal switch of the processing unit.
2. Check the blade´s position.
3. If the blade is not yet adjusted to the correct cutting direction, it is necessary to parameterize a blade offset for the rotating axis of the cutting unit.

Warning !

If the blade is not adjusted correctly by an offset value several components could be damaged seriously (e.g. the work piece, the cutting mat, the blade, the machining system or the processing unit).

2.5 Usage of different oscillation inserts

To realize a wide variety of cutting applications inserts with different working strokes are offered (stroke 1mm, 2mm, 3mm, 4mm, 5mm, 6mm). Voltage and rotation speed of the oscillation motor have to be chosen according to the used working stroke. Considering the motor´s current limit, it is possible to realize higher oscillation frequencies while using a lower working stroke. For higher working strokes it is advisable to use a lower rotation speed to minimize wear.
Especially for cutting strong materials it is advisable to use the technology of impact cutting. In this case the blade leaves the material with each stroke and pierces it with the next. This kind of cutting technology should be used for thin materials. It needs longer working strokes at lower oscillation frequencies.

Replacing the oscillation insert:

(a) Shut off the machining system and remove the processing unit mechanically and electrically.

(b) Remove the cover plate by untightening 8 screws.

(c) Untighten 4 screws of the oscillation motor on the back side of the processing unit´s main body.

(d) Remove oscillation motor (including motor cooler) from the main body while pulling out the motor cable from the electronic housing. Be very careful not to damage the cable.

(e) Untighten headless screw and remove the oscillation insert from the motor shaft.

(f) The reassembly has to be done in reversed order. The headless screw and the thread inside the oscillation insert have to be cleaned and degreased before being reassembled with thread lock fluid (Loctite 243). Then reassemble oscillation insert and axis by using ball-bearing grease while making sure that the oscillation axis is mounted in the right direction referring to the actuators guidance.

Warning !

While reassembling the oscillation unit special care must be taken to remain a distance of 0,5 – **max. 1mm (!)** between back side of oscillation unit and front side of motor. **A larger distance will cause damages to ball bearing, oscillation unit, motor and oscillation axis!**

2.6 Maintenance

The processing unit has to be checked and cleaned periodically. Blunt blades have to be replaced immediately, since they negative affect the cutting results, increase the load on the kinematics and shorten the lifetime of wear parts.

Warning !

Before carrying out any maintenance work it is necessary to ensure that no actuator or drive motor of the processing system or the machining system can move. Therefore it is essential to shut off the machining system or to remove the processing unit mechanically and electrically. It is strongly advised to observe the safety regulations of the respective machine manufacturer. There is a high risk of injury because of moving parts and very sharp blades.

To ensure a long lifetime of wear parts the oscillating axis and moving parts have to be greased periodically:

(a) Untighten 4 screws of the oscillation motor on the back side of the processing unit. Then pull out the oscillation motor approximately 1cm. Be careful not to damage the cable. Now it is possible to pull out the oscillation axis.

(b) The oscillation axis has to be cleaned accurately. Then the collets for oscillation motor and actuator have to be lubricated with bearing grease.

(c) Reassemble the parts in reversed order. Make sure that the oscillation axis is mounted in the right direction referring to the actuators guidance.

Due to the high frequency of oscillation a natural wear of moving parts can not be avoided. Stress and wear are strongly influenced by following factors:

- Cut material
- Cutting depth
- Type of cutting mat
- General handling

At the end of their shelf-life, especially the following wear parts have to be replaced:

- Fork guide for oscillation axis
- Oscillation axis
- Oscillation insert and ball bearings
- Slide bearings

3. Technical specifications

	EOT-2 stepper motor	EOT-2 servomotor
Height approx.	192 mm	219 mm
Width approx.	58 mm	
Depth approx.	86 mm	
Depth with oscillation motor cooler	150 mm	
Distance from center clamp collar to back side of body appr.	29 mm	
Weight (approx.)	2.900g	
Diameter of clamp collar	43mm	
Working stroke	variable with different oscillation inserts (1mm – 7mm)	
Oscillation frequency	approx. 3500 –7000 stroke per minute	
Blade shaft	6mm-h7 with Weldon clamping surface	
Blade alignment	by Weldon clamping surface	
Turning range	360 degrees, turning range not arrested, possibility of continuous circular operation	
Connector	Sub-D 25 pins	Sub-D 25 pins + connector for power supply of servomotor
Power supply for electronics	12V-DC	
Power supply for oscillation motor	12V-DC to 20V-DC	
Control of actuator	external stepper driver (not included in delivery)	external servo driver (not included in delivery)

4. Connector assignment

The following table 1 shows the assignment of the integrated 25-pin D-Sub connector.

Important security advise !

The mechanical and electrical combination of the cutting unit and the machining system has to be done by an expert only. It is not allowed to put the unit in operation before all necessary and required country-specific safety regulations have been observed and checked carefully. Only the operator of the facility (i.e. machining system) is responsible for observing all relevant safety regulations.

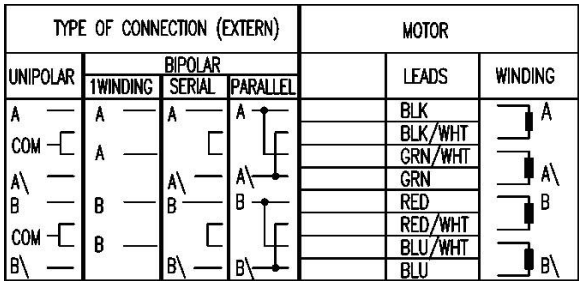
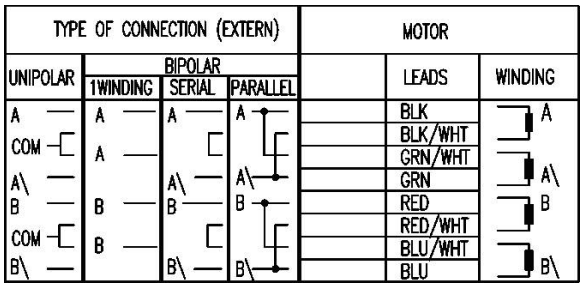
Electric drive motor and control electronics have to be fused externally; the maximum current of the drive motor must not exceed 2.8 ampere.

Especially for applications of continuous use the temperature of the drive motor has to be monitored; the max. operating temperature of the DC-motor must not exceed a value of 65 degree celsius. It is necessary to install a temperature termination that effects a shut down of the machining system in case of excessive temperatures.

For smooth operation and low wear we offer a motor cooler (electric or pneumatic). More details are available in the area of accessories.

	Electric motor cooler unit 12V-DC; cooling element with internal cooling fins; fan-adaptor and fan Art.-No. 240050
	Pneumatic motor cooler unit; cooling element with internal cooling fins; adaptor and hose connector Art.-No. 240060

Table 1: Connector assignment

PIN	Cable colour	Function / description	Remark
1	red	+12V electronics for position sensor and optional motor cooler	A
2	brown	Relay PIN 4	B
3	blue	Relay PIN 5	
4	red	+12V – 20V oscillation motor	C
5			
6	blue-white		D
7			
8	red		
9			
10	green-white		
11			
12	black		
13			
14	black	0V electronics for position sensor and optional motor cooler	A
15	yellow	Relay PIN 3	B
16	black	0V oscillation motor	C
17			
18	blue		D
19			
20	red-white		
21			
22	green		
23			
24	black-white		
25			

The notes following on the next page must be observed carefully.

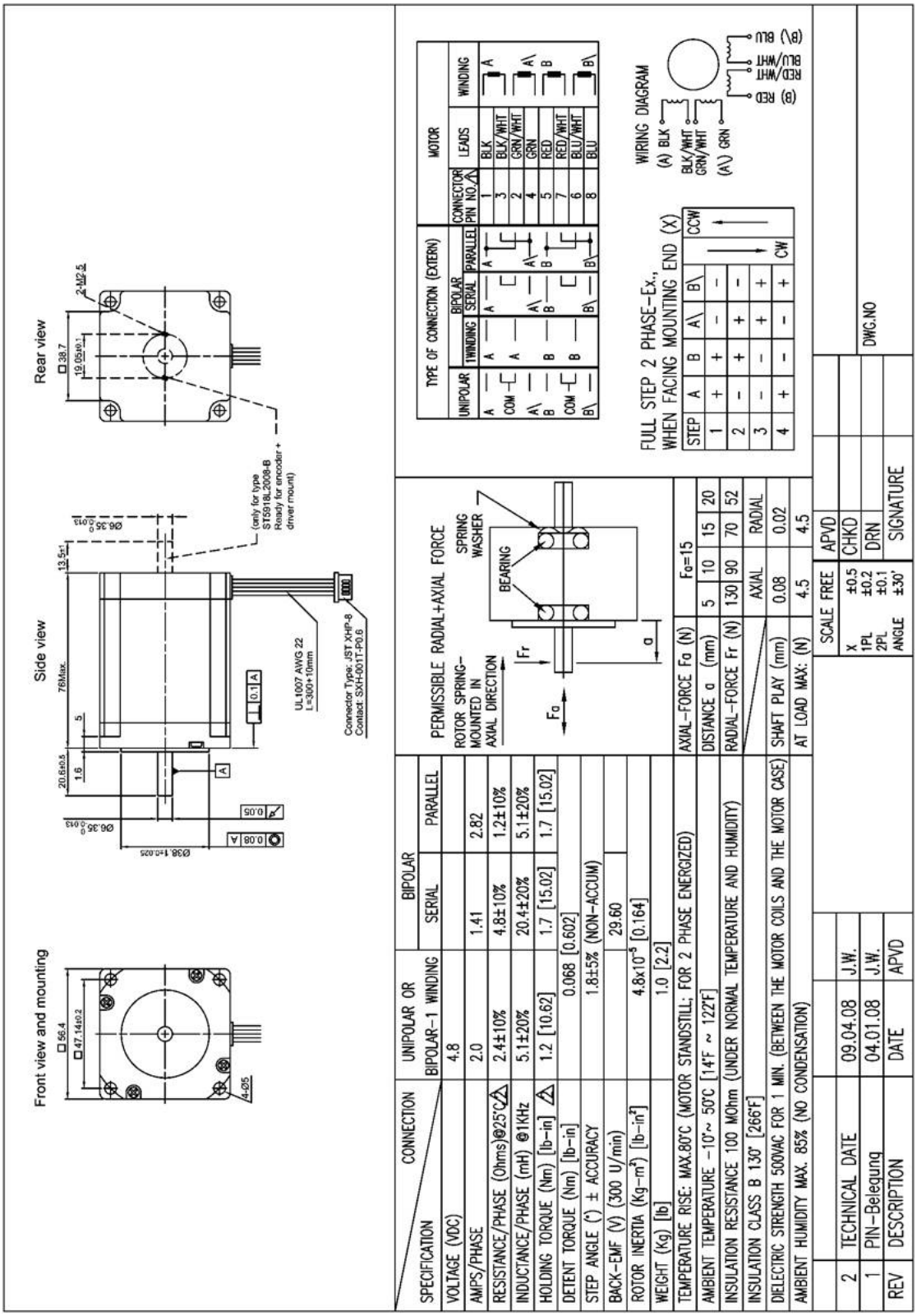
4.1 Remarks to the connector assignment

Remark	Description
A	The electronic system for the position sensor has to be supplied with a direct current of 12V (DC). The polarity must be respected carefully because otherwise electronics and/or fan may be damaged.
B	The position sensor controls an integrated relay that can be used by the supervising CNC controller as a limit or reference switch: • Once the blade has reached the homing point during a reference run, there is contact between **PIN3** and **PIN15** of the Sub-D connector. • If the blade is located outside the reference position, there is contact between **PIN2** and **PIN15** of the Sub-D connector. • Depending on the applied CNC controller, the integrated relay can be used as a normally closed switch (NC) or as a normally open switch (NO).
C	The nominal voltage of the installed oscillation motor is indicated with 12V DC. This voltage effects a theoretical oscillation frequency of 3500 strokes per minute. An increasing voltage induces a higher oscillation frequency at a higher current.
D	The connection of the stepper motor depends on the driver used. The following documentation has to be observed carefully.

Warning !

The electrical and mechanical connection of the processing unit has to be done with utmost accuracy by an expert only. It is not allowed to put the unit in operation before all necessary and required country-specific safety regulations have been observed and checked carefully. Only the operator of the facility (i.e. machining system) is responsible for observing all relevant safety regulations.

4.2 Stepper motor specifications



SPECIFICATION \ CONNECTION	UNIPOLAR OR BIPOLAR-1 WINDING	BIPOLAR SERIAL	BIPOLAR PARALLEL
VOLTAGE (VDC)	4.8		
AMPS/PHASE	2.0	1.41	2.82
RESISTANCE/PHASE (Ohms)@25°C	2.4±10%	4.8±10%	1.2±10%
INDUCTANCE/PHASE (mH) @1KHz	5.1±20%	20.4±20%	5.1±20%
HOLDING TORQUE (Nm) [lb-in]	1.2 [10.62]	1.7 [15.02]	1.7 [15.02]
DETENT TORQUE (Nm) [lb-in]	0.068 [0.602]		
STEP ANGLE (°) ± ACCURACY	1.8±5% (NON-ACCUM)		
BACK-EMF (V) (300 U/min)	29.60		
ROTOR INERTIA (Kg-m²) [lb-in²]	4.8×10^{-5} [0.164]		
WEIGHT (Kg) [lb]	1.0 [2.2]		
TEMPERATURE RISE: MAX.80°C (MOTOR STANDSTILL; FOR 2 PHASE ENERGIZED)			
AMBIENT TEMPERATURE -10°~ 50°C [14°F ~ 122°F]			
INSULATION RESISTANCE 100 MOhm (UNDER NORMAL TEMPERATURE AND HUMIDITY)			
INSULATION CLASS B 130° [266°F]			
DIELECTRIC STRENGTH 500VAC FOR 1 MIN. (BETWEEN THE MOTOR COILS AND THE MOTOR CASE)			
AMBIENT HUMIDITY MAX. 85% (NO CONDENSATION)			

AXIAL-FORCE Fa (N)	Fa=15			
DISTANCE a (mm)	5	10	15	20
RADIAL-FORCE Fr (N)	130	90	70	52
SHAFT PLAY (mm)	AXIAL 0.08		RADIAL 0.02	
AT LOAD MAX: (N)	4.5		4.5	

REV	DESCRIPTION	DATE	APVD
2	TECHNICAL DATE	09.04.08	J.W.
1	PIN-Belegung	04.01.08	J.W.

SCALE FREE	
X	±0.5
1PL	±0.2
2PL	±0.1
ANGLE	±30'

5. Accessories:

5.1 General accessories for EOT and TCM

Article No.	Description	
220012	**E12** - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, useable on both sides Length of cutting edge : 12 mm Total length : 25 mm Cutting edges : 2 Type : 6mm h7 / Weldon	
220018	**E18** - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, one-sided blade for fine lines Length of cutting edge : 13,5 mm Total length : 26,5 mm Cutting edges : 1 Type : 6mm h7 / Weldon	
220025	**E25** - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, one-sided blade for fine lines Length of cutting edge : 25 mm Total length : 39 mm Cutting edges : 1 Type : 6mm h7 / Weldon	
220028	**E28** - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, one-sided blade for fine lines Length of cutting edge : 30 mm Total length : 45 mm Cutting edges : 1 Type : 6mm h7 / Weldon	

220030	**E30** - Special blade for TCM module; wedge blade 30 degrees for normal foils and writings Length of cutting edge : 2,5 mm Total length : 25 mm Cutting edges : 1 Type : 6 mm h7 / Weldon	
220050	**E50** - Special blade for TCM module; wedge blade 50 degrees for flock textile foils, felt, cardboard Length of cutting edge : 3,5 mm Total length : 25 mm Cutting edges : 1 Type : 6 mm h7 / Weldon	
220070	**E70** - Special blade for TCM module; wedge blade 70 degrees for flock textile foils, felt, cardboard, rubber Length of cutting edge : 8 mm Total length : 25 mm Cutting edges : 1 Type : 6 mm h7 / Weldon	
220085	**E85** - Special blade for EOT module; e.g. for soft polyurethane foam panels Length of cutting edge : 50 mm Total length : 65 mm Cutting edges : 1 Type : 6mm h7 / Weldon	
220087	**E87** - Special blade for EOT module; e.g. for soft polyurethane foam panels Length of cutting edge : 70 mm Total length : 83 mm Cutting edges : 1 Type : 6mm h7 / Weldon	

220092	**E92** - Special blade for EOT module; e.g. for soft polyurethane foam panels Length of cutting edge : 120 mm Total length : 133 mm Cutting edges : 1 Type : 6mm h7 / Weldon	
230200	**EC4** - Long life cutting mat; intended to be used on vacuum tables; useable on both sides Material Thickness : 4mm Roll width : 2000 mm Colour : grey	

5.2 Special accessories for the EOT (electric oscillating tool)

Article	Description	
240050	Electric motor cooler: For high ambient temperatures and for long periods of use, we offer a drive motor cooler with12V DC fan and internal cooling fins. The cooler preserves the motor and extends its lifetime.	
240060	Pneumatic motor cooler: We offer a pneumatic cooler for very high ambient temperatures. The cooler is connected to the compressed air system of the CNC-machine with a quick-plug tube.	
230300	Fork guidance for oscillation axis	
240310	Oscillation axis	
240320	Oscillation insert with ball bearing (working stroke 1mm – 6mm)	
240330	Set of slide bearings	